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SeQure® microcatheter: A new kid on the block for a better controlled embolization reduces the risk of nontarget embolization

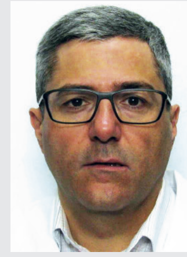
Geert Maleux discusses the challenge presented by trying to avoid nontarget embolization when performing catheter-directed embolotherapy. As an all too common complication, Maleux argues that the SeQure® microcatheter (Guerbet) appears to be a promising solution to evade the backflow of microparticles whilst still conducting the embolization in "free flow".

NONTARGET EMBOLIZATION remains one of the most common complications related to catheter-directed embolotherapy. Various causes of nontarget embolization have been identified, including backflow of embolics into nontarget arteries, poor catheter tip positioning proximal to nontarget vessels, or embolization of a target vessel associated with an arteriovenous fistula.

Nontarget embolization is well-known in hepatic (chemo-)embolization, but may also occur in other territories, including bronchial, gastrointestinal, uterine or prostate arteries. Potential complications related to nontarget embolization might be asymptomatic, but in a substantial number of cases, these complications can result in serious clinical symptoms prompting immediate treatment. Type and severity of complications depend on several factors, including the vascular territory embolized, the type and amount of embolics used, and the general status of the patient.

In hepatic (chemo-)embolization, nontarget embolization of hepatoenteric vessels may result in ischaemic cholecystitis, pancreatitis and gastritis, or even in gastroduodenal ulceration.

Nontarget embolization following bronchial artery embolization may result in muscular pain, dysphagia, or even paraplegia if embolics are unintentially injected into the intercotal, aesophageal, or spinal arteries, respectively.


Geert Maleux

In the pelvic region, nontarget embolization may occur during prostate artery and uterine artery embolization. In case the rectal or vesical artery is embolized during prostate artery embolization for the treatment of benign prostatic hypertrophy, this may result in lower gastrointestinal or bladder ulceration, respectively. In uterine artery embolization for the treatment of myoma, nontarget embolization is clinically less frequent, but reports dealing with vaginal mucosa or skin ulceration have been described.

In clinical practice, a substantial number of inadvertent complications related to nontarget embolization can be avoided by careful analysis of the angiographic images obtained during the embolization procedure and by slow injection of the embolics under fluoroscopic guidance. However, even in experienced hands using the best angiographic equipment, nontarget embolization is still a problem. It is not surprising that many researchers have tested various interventional techniques to avoid complications of nontarget embolization: protective proximal coil-embolization of nontarget vessels, like coil- or plug-embolization of the proximal right gastric or gastroduodenal artery prior to hepatic chemo- or radioembolization; use of an occlusive balloon to avoid backflow or to perform subtotal embolization in case the target artery can only be cannulated proximal to nontarget vessels.

In order to avoid backflow of microspheres during embolotherapy and still perform the embolization procedure in 'free flow', the SeQure® microcatheter seems to be a promising solution. *In vitro* and animal studies have already shown the efficacy in reducing backflow of microspheres during embolization in various arterial territories, compared to regular microcatheters with use of the same type of microspheres (diameter >70 microns). Additionally, use of the SeQure® microcatheter also resulted in the delivery of a higher amount of microspheres into the target tissues, whitch could result in better clinical outcomes, for example in chemoembolization, bronchial artery embolization, or even in uterine or prostate artery embolization. However, multicentre, comparative studies are needed before implementing this new technology as the standard of care for these embolization procedures.

***Geert Maleux**, MD, PhD, is an interventional radiologist in the Department of Radiology, University Hospitals KU Leuven, Leuven, Belgium. He has received consulting and speaker honorary from Guerbet.*

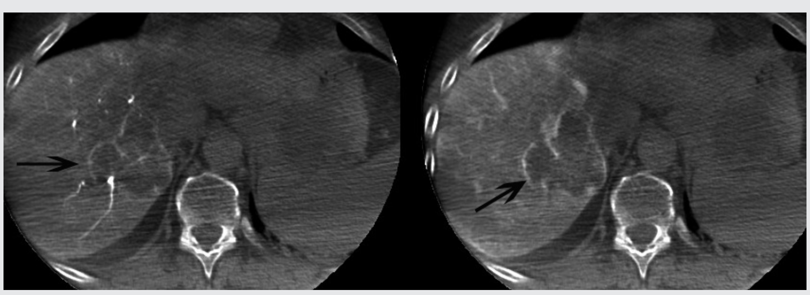


Fig. 1: dual-phase cone-beam CT before chemoembolization reveals predominant right-sided colorectal liver metastases (arrow) with central necrosis.


Fig. 2: selective hepatic angiography before DEBIRI-chemoembolization reveals homogeneous opacification of the right and left liver lobe.


Fig. 3: selective hepatic angiography after DEBIRI-chemoembolization with use of the Sequre microcatheter shows postostial occlusion of the right hepatic artery (arrow) and fully patent left hepatic artery (arrowheads) and end branches.

New system for tracking catheters using optical fibres promises easier navigation

A new visualisation method enables more precise catheter navigation through the vascular system. It is being developed at the Fraunhofer Institute for Digital Medicine (MEVIS) in Bremen, Germany, and one of its ambitions is to reduce physician radiation exposure.

The "intelligent catheter navigation", or Intellicath method, uses a catheter equipped with an optical fibre containing tiny "mirrors". When light passes through the fibre, the mirrors reflect a portion of the light. Whenever the fibre bends, the reflected light changes colour. Sensors can measure the change in colour.

"The signal from the sensors gives us information about the intensity and direction of the curvature," Torben Pätz, a mathematician at Fraunhofer MEVIS, explains in a news release. "To some extent, the fibre knows how it is formed."

Around the world, millions of endovascular procedures are performed per year, using X-ray guidance to place stents or remove blood clots. This results in radiation exposure for patients and physicians alike, and an additional challenge is that X-rays do not provide the most precise images, according to Pätz.

Before the procedure, physicians obtain CT or MR images of the patient. Based on this image data, IntelliCath software creates a 3D model of the vessel system and displays it on a monitor. During the endovascular procedure, live data from the fibre navigation is fed into the model. The doctor views the monitor to see how the device moves through the vascular labyrinth live and in 3D.